Role of convective sources in shaping the troposphere and stratosphere

Surendra Kumar DHAKA[(1)], Hiroyuki HASHIGUCHI[(2)], Yoshiaki SHIBAGAKI[(3)], Vinay KUMAR[(1)], and Hye-Yeong CHUN[(4)]

(1) Department of Physics, Rajdhani College, University of Delhi, India

(2) RISH, Kyoto University, Japan

(3) Osaka Electro-communication University, Japan

(4) Department of Atmospheric Science, Yonsei University, South Korea

We have used data from radars during different convection seasons over Indonesia and India to demonstrate the influence of convection in connecting the lower troposphere to upper troposphere. In addition, we have also used COSMIC satellite radio occultations temperature data over the globe covering almost a decade, mainly over tropical latitudes. Temperature analyses for association of lower and upper troposphere are shown over different regions of the globe having contrast topography namely over Eastern Pacific sector, Indian sector, and African sector. Correlation coefficient, taken as a measurement of association, show specific longitudinal differences between lower troposphere (from 1 km to 5 km height) and cold point tropopause (CPT). The Northern and Southern hemispheres show contrast coupling between lower tropospheric region and the CPT. Land and ocean effects are found to contribute in a different way to the correlation coefficient (r_{xy}) between lower troposphere and CPT. Analyses show symmetrical structure of r_{xy} on both side of the equator over the African region, as data included over land region on both side of equator. Data represent positive correlation (r_{xy} ~ 0.5) over 15^{o}-20^{o} latitudes on either side of the equator over African region, suggesting the strong hold of variation of seasonal solar diabatic heating influence over the tropic of cancer and tropic of Capricorn. On the other hand, there is a contrast behavior over the Indian region, r_{xy} is nearly negative (~ -1.0) each year in the southern hemisphere (SH) and positive (~0.4) in the northern hemisphere (NH) with a maxima near tropic of cancer. Analyses suggest that variability in CPT over different regions of globe show significant seasonal association with the lower troposphere. Thus CPT variability, not only governed by QBO, ENSO, gravity waves and Kelvin wave system as reported in earlier studies rather it also considerably affected by seasonal changes taking place in the lower troposphere.